event semantics

Semantics 3, UCLA Linguistics

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1 introduction to event semantics

- Classical: $[\![\text{run}]\!] = \lambda x.\text{run}(x)$
- Davidsonian: $[\![\text{run}]\!] = \lambda x \lambda e.\text{run}(x)(e)$
- Neo-Davidsonian:
  - lexical: $[\![\text{chase}]\!] = \lambda y \lambda x \lambda e.\text{chase}(e) \wedge \theta_{SU,chase}(x)(e) \wedge \theta_{DO,chase}(y)(e)$
  - compositional: $[\![\text{chase}]\!] = \lambda e.\text{chase}(e)$
    (with theta roles elsewhere in the tree associating agents and patients, etc.; see below)
  - existential closure binds the event variable at the end of the utterance in the absence of overt binding
- two types of arguments for events:
  1. parallels to individual domain
     - modifiers (Davidson, 1967; Parsons, 1990)
       - what's the type of modifiers again?
       - intersective (individual) modifiers have two properties: (a) they permit permutation; (b) they license drop

         (1) a. Mimi is a 40-yr-old, brunette, green-eyed Argentinian.
             b. Mimi is a green-eyed, brunette, 40-yr-old Argentinian.

         (2) a. Mimi is a green-eyed Argentinian dressed in a suit.
             b. Mimi is an Argentinian dressed in a suit.

       - parallel to events (Landman, 2006):

         (3) a. Brutus stabbed Caesar in the back through his toga with a knife.
             b. Brutus stabbed Caesar with a knife through his toga in the back.
             c. Brutus stabbed Caesar through his toga.

     - quantifiers:

       (4) a. Every time the bell rings, it wakes John up.
           b. $\forall e[\text{ring(the-bell)}(e) \rightarrow \exists e'[\text{open(j,the-door)}(e') \wedge M(e') = e]]$

       - arguments this isn't about times (Lewis, 1970):

         (5) *Every short time the bell rings, it wakes John up.

         (6) When/Whenever/??Every time a quadratic equation has a solution, it's positive.

2. empirical need for them
   - why not just times & locations? or a ⟨time, location, world⟩ triple?
     - two different events may occur at the same time, at the same location, and at the same time/location.

       (7) Michael won the race by limping across the finish line

     - the *by*-phrase describes not Michael as he wins (it's causal!) and not races or times
     - assume M's winning the race is spatiotemporally collocated with M's collapsing from fatigue

       (8) ↛ Michael collapsed with fatigue by limping across the finish line.

     - more complicated example: two lasers firing at the same location at the same time... can we say there are two different firings?
   - frequency adverbials (Landman, 1993)

     (9) Q: How many times did Brutus stab Caesar?
     A: I saw him do it. It was revolting. In each hand, he had a hayfork. He stabbed him with the one in the front, and with the other in the back at the same time. So he stabbed him twice.

   - event(uality) reference (Bauerle, 1988)

     (10) a. The train broke down. It surprised me.
     b. The train didn't break down. It surprised me.
     c. The train broke down. It happened at the station.
     d. The train didn't break down. *It happened at the station.

   - plurals and collectivity/distributivity

- severing the external argument from the verb (Kratzer, 1999)
   - proposal: theta-roles for external arguments (e.g. themes) are not assigned by the verb
   - motivation: internal arguments affect interpretation of verb, external arguments do not

     (11) a. throw a baseball/boxing match/party/fit
     b. take a nap/aspirin/bus to New York/book from the shelf
     c. kill a cockroach/conversation/bottle/audience

   - Kratzer: an event version of predicate modification, 'Event Identification,' allows sets of events (type $\langle s, t \rangle$) to conjoin
   - lots of counterarguments (Bale, 2007; Ausensi et al., 2021):
     - if Kratzer's proposal to sever the external argument is right, then *again* should be able to attach to VP before combining with Voice
     - the prediction is that this would produce an agentless presupposition that can be satisfied by an event of the same type but with a different agent
     - (it can't)

       (12) Seymour's dryer broke. He called the fixiter who hit the dryer until it started working. The dryer broke down again two days later. So...
       a. Seymour hit the dryer again.
       b. #Again Seymour hit the dryer.
       c. The dryer was hit again.

       (13) Brendan kicked the soccer ball towards the next, but didn't quite make it. So...
       a. Anne kicked it again.
       b. #Again Anne kicked it.
       c. It was kicked again.

2 telicity and cumulativity of reference

- (see appendix)
- updated Linkian semantics (from Bach, 1986):
  - E_e: the set of events with join operation $\sqcup_e$, partial ordering $\leq_e$ (a complete atomic Boolean algebra);
  - $A_e \subseteq A_e$: atomic events;
  - $D_e \subseteq A_e$: bits of process with join $\sqcup_p$ and partial ordering $\leq_p$ (a complete join semilattice);
  - Two temporal relations on $E_e \times E_e$:
    - $\propto$: 'strictly precedes" (transitive, irreflexive, asymmetrical);
    - $\circ$: "overlaps" (nontransitive, reflexive, symmetrical);
  - A homomorphism h_e from $\langle E_e, \cup_e, \leq_e, \propto, \circ\rangle$ to $\langle D_e, \cup_p, \leq_p, \propto, \circ\rangle$ such that

    (i) $h_e(\alpha) = \alpha$ iff $\alpha \in D_e$,

    (ii) $h_e(\alpha \cup_e \beta) = h_e(\alpha) \cup_p h_e(\beta)$, and

    (iii) $\alpha R \beta \Rightarrow h_e(\alpha) R' h_e(\beta)$ for $R = \leq_e, \propto, \circ$ and $R' = \leq_p, \propto [, \circ]$ respectively.

    "Our homomorphism will deliver up for us the bounded bits of process corresponding to instances of each of these event types."
- A plural event of type (10) has (necessarily) a singular event of type (11) as an *i*-part, and the processes associated by h with the latter is a *p*-part of the process associated with the former.

  (10) Mary stumble and Mary twist her ankle: plural event

  (11) Mary stumble: atomic event
- Packaging/grinding... context and/or morphology (Slavic)[1]

  (14)
  a. Much missionary was eaten at the festival.
  b. The pit contained five (different) muds.
  c. ?I finished looking for a unicorn.
  d. I finished looking for a book.

  Asymmetry: count $\rightarrow$ non-count; non-count $\rightarrow_?$ count, because the homomorphism from count to non-count is many-to-one
- the Imperfective Paradox

  (15)
  a. There's apple in this salad. *entails the presence of apples*
  b. This is part of a paper on natural language metaphysics. *doesn't entail the existence of a (complete) paper*

  (16)
  a. Kip crossed the street. *entails a street-crossing*
  b. Kip was crossing the street. *doesn't entail a street-crossing*

[1] I looked up what the hell 'Slavic' was a reference to when I realized that Noah's ears would perk up! Here's the quote from Bach (p11): "In English, the way of switching back and forth between count and mass, event and process typically involves no change in the forms involved. The difference is rather induced by the context. In other languages, overt morphological processes or relationships are available or obligatory, for example, in the perfective-imperfective contrasts in Slavic languages."

3 object and event readings: Krifka 1990

(17) a. Four thousand ships passed through the lock last year.
b. The library lent out 23,000 books in 1987.
c. Sixty tons of radioactive waste were transported through the lock last year.
d. The dry cleaners cleaned 5.7 million bags of clothing in 1987.
e. 12,000 persons walked through the turnstile yesterday.

- Carlson (1977): a reading about individuals and a reading about individuals indexed to times
  Krifka: passing through the lock isn't instantaneous (1a), nor does it nec. refer to distinct individuals (1c)
- quantifiers

(18) a. Most ships passed through the lock at night.
b. Every ship passed through the lock at night.
c. No ship passed through the lock at night.

  - can we come up with a model in which one reading of (37a) is true and the other is false?

- anaphora

(19) a. 4,000 ships passed through the lock last year. *They* transported radioactive waste.
b. Sixty tons of radioactive waste was transported through the lock last year. *It* was declared as powdered sugar.

  - we want e.g. *they* to refer to the group of ships passing through the lock last year;
  - this set can be different for the event reading than it is for the object reading.
  - "The problem is to account for the event-related interpretation, as we cannot assume that the first sentence directly introduces an object which is four thousand ships such that the pronoun can refer to that object" (p.516).
  - move: *they* doesn't refer to an entity introduced by the preceding sentence, but rather "an entity which is conventionally related to an entity which is introduced in the preceding sentence" (p.516).

(20) There was an old car standing in front of the house. *The windshield* was broken.

(21) a. I dropped 10 marbles and found all of them, except 1. It's probably under the sofa.
b. I dropped 10 marbles and found only 9 of them. #It's probably under the sofa.

- formalism:
  - lattice sorts: joins indexed to sorts, as in $x \cup_\Sigma y$ (with $x \subseteq x \cup_\Sigma y$)[2]
  - witness element: $x \subset y \rightarrow \exists z, z \subset y, \neg x \circ z$
  - partition: $x \subseteq y \cup z \rightarrow x \subseteq y \vee x \subseteq z \vee \exists w, w \circ y \wedge w \circ z, x \subseteq w$

(22) Lattice Sorts:
a. Objects: O, with $\cup_O$, $\subseteq_O$, $\subset_O$, $\circ_O$, variables u, u'...
b. Events: E with $\cup_E$, $\subseteq_E$, $\subset_E$, $\circ_E$, variables e, e'...
O and E are disjoint: $\neg\exists x[O(x) \wedge E(x)]$

- cumulative reference property (again):
  - Link (1983): mass nouns and plurals show cumulativity of reference (two puddles are both of water, two farms are both of horses), but not singular count nouns

[2] "It is reasonable to claim that there is no element in Σ which is part of every element, that is, Σ should have **no bottom element**" (p.490).

- Bach (1986); Krifka (1989): atelic verb (phrases) show cumulativity of reference, but not telic ones

(23) $\text{CUML}_\Sigma(P) \leftrightarrow P \subseteq \Sigma \wedge \forall X[X \subset P \wedge X \neq \emptyset \rightarrow P(\text{sup}_\Sigma(X))]$

- measure function: from "concrete entities" to "abstract entities"... "homomorphisms which preserve an empirical relation in an arithmetical relation" (p.494).
  - measures are related linearly (<) and added via concatenation (+)
  - $[\![\text{sixty tons of radioactive waste}]\!] = \lambda u[\text{rw}'(u) \wedge \text{ton}'(u) = 60]$
  - $[\![\text{ship}]\!] = \lambda n \lambda u[\text{ship}'(u) = n]$[3]; $[\![\text{four thousand ships}]\!] = \lambda n[\text{ship}'(u) = 4000]$
- extensions... time readings (and measure functions on times)?

(24) Only two hundred fatalities later did the senate of Hamburg take any measures to hinder the cholera epidemic.

appendix: aspect

- a two-tiered theory of aspect:
  1. **viewpoint aspect** (aka grammatical aspect) locates events in time
  2. **aktionsart** (aka lexical aspect) concerns the temporal constituency of events
- viewpoint aspect:

(25) a. Fiona is singing the song. **imperfective**
b. Fiona was singing the song.
c. Fiona will be singing the song.

(26) a. Fiona sings the song. **perfective**
b. Fiona sang the song.
c. Fiona will sing the song.

(27) Jo used to kick the cat. **habitual**

  - perfective: event time is contained in the reference time
  - imperfective: event time properly contains reference time
  - tests:
    - completion entailment, a.k.a. the **imperfective paradox** (Dowty, 1979)

(28) a. Fiona was singing the song. $\nrightarrow$ Fiona finished singing the song.
b. Fiona sang the song. $\rightarrow$ Fiona finished singing the song.

    - interpretation of temporal relations

(29) a. Fiona was singing the song when the earthquake hit. *simultaneity*
b. Fiona sang the song when the earthquake hit. *sequencing*

(30) a. ?Fiona was singing the song after the earthquake hit.
b. Fiona sang the song after the earthquake hit.

    - interpretation of temporal adverbials

[3] "To handle count noun constructions in the same way, we have to assume that they have a measure function built into their semantic representation" (p.496).

(31) a. Between 10 and 11, Fiona was singing the song. *durative*
b. Between 10 and 11, Fiona sang the song. *durative or inclusive*

- acceptability with completive adverbials

(32) a. *Fiona was singing a song in an hour.
b. Fiona sang a song in an hour.

- Aktionsart, aka verbal categories (really VP categories); attributed to Vendler (1957); Dowty (1979):
  - **states vs. events**
    - states (eg. *love, know*): incompatible with the progressive (in English), and imperative

(33) Ethel is ?knowing the answer/playing golf.

      - no culmination point
      - bad in the progressive
  - within the event class: **telic vs. atelic** VPs
    - **activities** are atelic (*running, walking, losing, driving a car*):
      - compatible with *for* PPs
      - imperfective form entails perfective form
      - lack a natural culmination point
      - non-progressive forms "describe episodes that consist of a period leading up to some point which terminates the episode"

(34) John ran for/*in an hour.

(35) The dog was howling. → The dog howled.

    - **achievements** (eg. *win, die*) are telic, but are momentous
      - intrinsic culmination point
      - refer to a culmination point in past tense
      - progressive form is incompatible with punctual adverbs (*was dying at 10:15*)
      - episode referred to by the progressive precedes that referred to by the non-progressive tense

(36) a. ?Jo recognized the dog for a few minutes.
b. The dog died for a few hours.

    - **accomplishments** (eg. *write* (*a letter*)) are telic an non-momentous
      - intrinsic culmination point
      - awkward in the past form with punctual adverbs (*wrote the letter at 10:15*)
      - episode referred to by the progressive is included in that referred to by the non-progressive

(37) a. Jo sketched the dog for a few hours.
b. The dog barked for a few hours.

type	**tests**	**examples**
states	can't form progressives atelic	*know geography, recognize Sue, love pizza*
achievements	can't form progressives telic (semelfactive?) present perfect sounds better than present	*recognize, find*
accomplishments	compatible with the progressive telic, but incremental homogeneous	*run a mile, draw a circle*
activities	compatible with the progressive atelic, compatible with *for*-phrases	*running, pushing a cart*

- NB evidence of non-culminating accomplishments crosslinguistically (Tatevosov, 2001; Martin, 2015)

(38) ni? cen qa:y-t t$^{\theta}$e spe?eθ ?i? ?ewe ni?-es ɋay.
AUX 1S.SUB kill-TR DET bear and NEG AUX-3S.SUB die
'I killed the bear but it didn't die.' *Halkomelem* (Salish)

(39) a. kerim eki minut-xa ešik-ni ac-xan-di.
K two minute-DAT door-ACC open-PFCT-3SG
'Kerim opened the door in two minutes.'
b. kerim eki saRat ešik-ni ac-xan-di.
K two hour door-ACC open-PFCT-3SG
'Kerim tried to open the door for two hours.'
(lit. 'Kerim opened the door for two hours.') *Karachay-Balkar* (Turkic; Caucasus)

- a relation we haven't (and won't, really) spend much time on: *when*-clauses

(40) When they built the 39th Street bridge...
a. ...a local architect drew up the plans.
b. ...they used the best materials.
c. ...they solved most of their traffic problems.

(41) #When my car broke down, the sun set.

  - several interpretations, all with a vague sense of causality/enablement:
    - while
    - just after
    - at approximately the same time as

- Moens and Steedman (1988): *when* isn't a temporal relation after all (and it's not ambiguous or causal): it establishes **temporal focus** by relating via **contingency** to a Reichenbachian reference time

- a new Aktionsart typology:
  - accomplishments like *reach the top* are now **culminations**:
    - punctual events
    - "accompanied by a transition to a new state of the world" (p16), i.e. a **consequent state**
    - characterizing consequences the speaker thinks are contingently related to other salient events
  - semelfactives like *hiccup* are now **point expressions**:
    - indivisible punctual events
    - "whose consequences are not at issue in the discourse" (p16)
    - incompatible with the perfect
  - activities like *climb* are now **processes**:
    - extended in time
    - lacking a culmination
    - compatible with *for* but not *in*
  - achievements like *climb to the top* are now **culminated processes**:
    - compatible with *in* but not *for*
    - extended in time, but with culminations
  - **states**

	EVENTS		STATES
	atomic	extended	
+conseq	**CULMINATION** recognize, spot, win the race	**CULMINATED PROCESS** build a house, eat a sandwich	understand, love, know, resemble
-conseq	**POINT** hiccup, tap, wink	**PROCESS** run, swim, walk, play the piano	

Figure 1.

references

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